

## ABSTRACT OF THE DISCLOSURE

A system (25) for detecting defects in a semiconductor wafer (10), such defects including voids (V) present in metal conductors (2, 4) and plugs (7), is disclosed. An x-ray source (20) irradiates the wafer (10) through a first aperture array (24) having openings (26); a second aperture array (28) is located on the opposite side of the wafer (10) from the source (20), and has openings (30) that are aligned and registered with the openings (26) in the first aperture array (24). An array of x-ray detectors (31) is located adjacent to the second aperture array (28), with each detector (31) associated with one of the openings (30) of the second aperture array (28). The detectors (31) communicate signals regarding the magnitude of x-ray energy that is transmitted through wafer (10) at locations defined by the openings (26, 30) through aperture arrays (24, 28), to an analysis computer (34). A wafer translation system (32) indexes or otherwise moves the wafer (10) between the aperture arrays (24, 28). The analysis computer (34) generates an x-ray image of the wafer (10) from the detected x-ray energy, or alternatively compares the detected x-ray energy at locations of wafer (10) to automatically detect and distinguish defects.